

6 Pollution Control

The major goal of the Bureau of Watershed Management is to minimize the impacts of humans and animals on water quality. Section 4 detailed the methods the Bureau utilizes on its own property, the most critical lands in the watershed for the water supply. Section 5 presented the various means used by BWM to monitor water quality. This section details the most significant pollution threats caused by people's presence in the watershed.

The Wachusett Reservoir watershed does not have "point" sources of pollution; i.e., there are no industrial or municipal pipes discharging effluent into any of the reservoir's tributaries. The remaining sources of potential pollution fall into the "non-point source" category. These threats do not emanate from a single location, but are present from various land uses and activities throughout the watershed.

The treatment of wastewater, whether by on-site septic systems or carried off-site through a sewerage system, is a critical component to water quality health. Significant resources have been expended to successfully control this pollution threat. The conveyance of a broader range of potential pollutants via stormwater has subsequently become a higher priority for the Bureau. On-going efforts remain to address site specific threats from transportation and hazardous materials. While agriculture and silviculture are still actively practiced in the watershed, these occupations are not nearly as prevalent as in the past; the Bureau has developed several approaches to minimize the impacts of these diminishing land uses.

6.1 *Wastewater Disposal*

On-site wastewater disposal systems have been considered by BWM for many years to be the most significant potential source of pathogens and other pollutants of concern within the Wachusett Reservoir watershed. Wastewater was targeted as a top priority at the time of the Division's formation in 1985 when the majority of the watershed was served by on-site systems. Many areas within the watershed had significant problems with failing on-site systems, and very limited repair options due to physical constraints. MDC began to take an active role in both on-site system and sewerage issues. A Facilities Plan was completed in 1995 for West Boylston and Holden that described a plan to bring sewers to those areas of the communities where system repairs were not feasible. The Facilities Plan also contained recommendations for areas that would continue to be served by on-site wastewater disposal systems.

The MDC program specifically targeted sewers for sensitive areas that were most impacted by failing on-site systems, had significant physical constraints limiting repairs, and where water resources were potentially impacted by failing systems. The sewage flows to the Upper Blackstone Water Pollution Abatement District, which discharges the treated effluent outside of the watershed. With the completion of the sewer project in 2004, 11,000 persons, or 40% of the watershed residents will have an available sewer system. The remaining 60% of the watershed, or approximately 17,000 persons, will utilize on-site systems.

6.1.1 Sewers

Accomplishments:

- Completed 80% of the sewer construction project, in cooperation with the Towns of Holden and West Boylston. This construction has taken place in the watershed's areas of greatest need for sanitary remediation due to poor performance and density of on-site septic systems.
- Reconstructed Route 70 sanitary sewers in Clinton.
- Drafted model Wastewater Management District legislation.
- Negotiated, executed and implemented updated sewer use agreements between Holden, West Boylston and the MDC.

Assessment:

Upon completion of the \$80 million sewer construction project, 85% of the built or buildable areas of Holden and West Boylston – the areas of the watershed where on-site wastewater systems most impacted water quality – will not use on-site septic systems.

Key Actions:

- Complete the Holden-West Boylston sewer project in 2004.
- Design and implement monitoring program for sewer connections.
- Administer Holden and West Boylston sewer use agreements.
- Implement Worcester sewer system improvements.
- Review Infiltration/Inflow reduction and monitoring issues between the city of Worcester, the Upper Blackstone Water Pollution Abatement District, and the towns of Holden, West Boylston and Rutland.

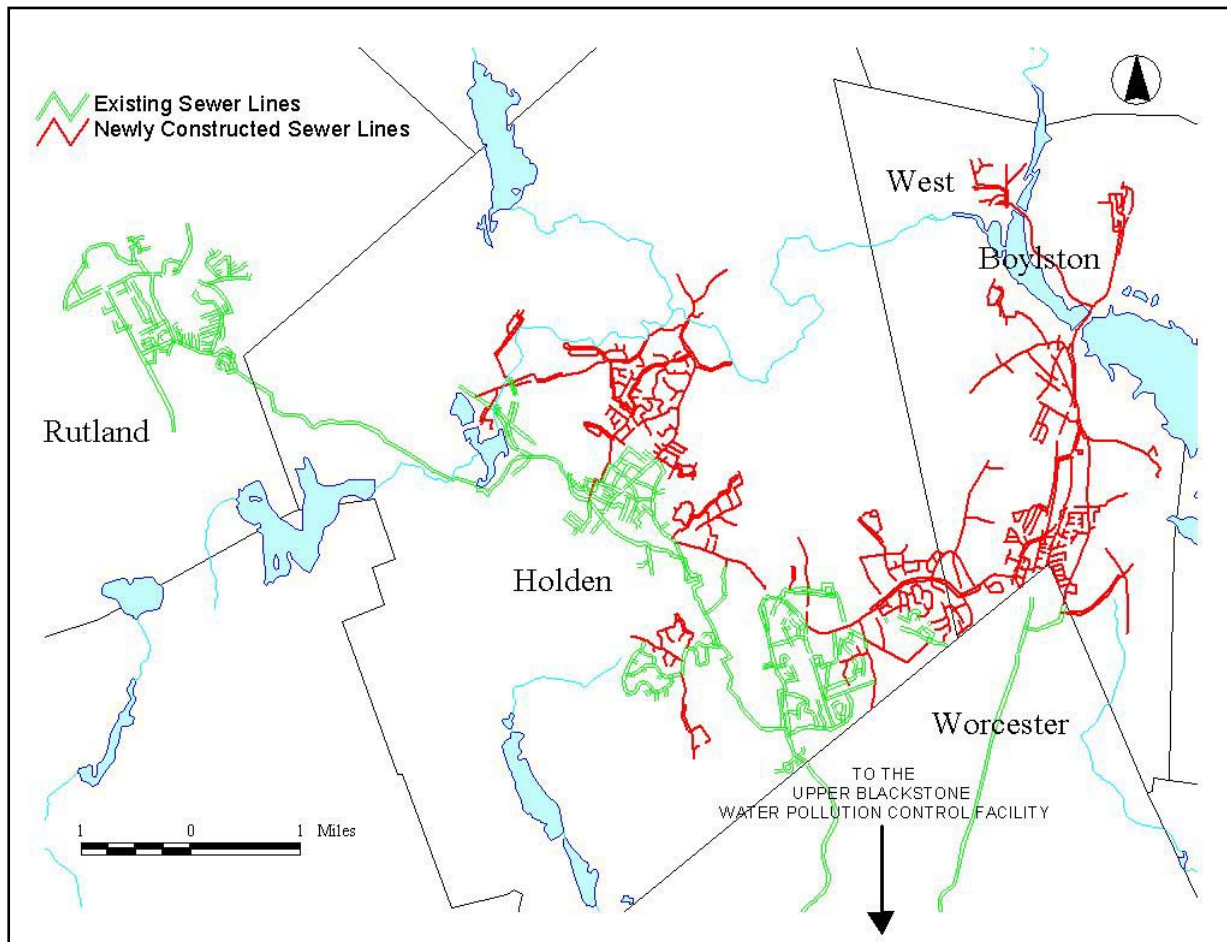
Background

The installation of sewers by the BWM in the Wachusett Reservoir watershed in order to help solve water quality issues was initially undertaken in the 1930s. The construction of the Rutland-Holden sewer line, authorized under c. 375 of the Acts of 1927 and c. 262 of the Acts of 1932, introduced sewer service to the region. Chapters 286 and 287 of the Acts of 1939 turned over the local sewer systems to the respective towns, but also required MDC (and subsequently MWRA) to continue to own, operate and maintain the Rutland-Holden Interceptor on behalf of those towns as well as to contract with Worcester for sewage transportation and treatment in that city's system.

The DWM evaluated several densely developed areas in Holden and West Boylston in 1993 that had soil conditions unfavorable for on-site septic systems and sanitary problems identified by Division water quality data. Following this study, the DWM and the towns of West Boylston and Holden completed a Wastewater Facilities Plan in 1995 that addressed the towns' sewer needs. The resulting Facilities Plan set out a program for phased construction of sewers to serve the areas of greatest need, based on a range of criteria including poor performance, water quality impact potential, and building density.

The areas to be sewered included the West Boylston industrial area, Pinecroft neighborhood, and the developed business and residential areas along Route 122A and Route 31 in Holden and along Route 12 in West Boylston. These areas are within West Boylston Brook, Gates Brook, Oakdale, Chaffin Pond and Lower Chaffin Pond, and Asnebumskit subbasins. These subbasins were found to have

Figure 6-1: Sewered Areas of Wachusett Reservoir Watershed



stream water quality most impacted by septic systems in several studies conducted by the Division (see Figure 6-1).

Current Program and Accomplishments

After several years of extensive negotiation and legislative activity, a financing program was enacted providing initially almost \$60 million to complete sewer system design and construction. Two supplemental budget amendments raised the total budget to \$78 million to incorporate among other things:

- \$66 million for sewer design and construction.
- Low-interest loans to property owners to finance installation of service connections.
- \$2.6 million for payment of membership costs for Holden, Rutland and West Boylston to become members of the Upper Blackstone Water Pollution Abatement District.
- \$1 million for Infiltration/Inflow removal from the Holden sewer system.
- \$600,000 for initial management start-up costs for West Boylston.
- \$2.3 million for improvements to the Worcester sewer system.



Sewer construction.

The majority of this funding – \$53.6 million, or 69% – was bonded by the Commonwealth through the MDC. The MWRA has contributed \$9 million, or 11% of the total cost. The two towns combined to pay 20% of the project; \$8.1 million for West Boylston and \$7.4 million for Holden. The towns utilized low-interest loans available through the DEP’s State Revolving Fund for infrastructure development.

The project was designed and constructed in phases. Phase I included Fast-Track design and construction of two sewer service areas. The West Boylston Industrial area was completed in 1998. The Pinecroft area in Holden and West Boylston was completed in 2000, with conveyance of the completed portions of the systems to the respective towns for operation and maintenance. Phase II included design of all remaining sewers (Phase III and Final Phase). Designs for Phases III and Final Phase were completed in 2001.

Phase III included two major construction contracts in West Boylston and three construction contracts in Holden. All gravity sewer and force mains in the Phase III contracts are complete and all of the Phase III sewer system components have been turned over to the towns for operation and maintenance. As of June 30, 2003 approximately 50% of the sewer service connections have been completed in the Fast Track and Phase III service areas.

Finally, improvements need to be made to the City of Worcester’s sewer system in order to accommodate the hydraulic flow from the new sewers in Holden and West Boylston. Work totaling \$2.3 million will be done at locations on Cambridge St. and Newton Sq. to remediate these problems.

Inflow and Infiltration (I/I)

Cracks, settling, tree root intrusion, and other disturbances that develop over time deteriorate pipe lines and other conveyance structures that comprise wastewater collection systems. These deteriorating conditions can increase the amount of inflow and infiltration (I/I) entering the system, especially during periods of wet weather. I/I is clean storm and/or groundwater that enters the sewer system through cracked pipes, leaky manholes, or improperly connected storm drains, down spouts and sump pumps. Most inflow comes from stormwater and most infiltration comes from groundwater.

Increased I/I levels create an additional hydraulic load on the system and thereby decrease its overall capacity. I/I levels also have an impact on maintenance and treatment costs. All sewer lines in the Wachusett Reservoir watershed towns of Holden, Rutland and West Boylston are connected through the City of Worcester’s sewer system to the Upper Blackstone Water Pollution Abatement District Treatment Plant in Millbury; the towns have contracts with the District regarding the amount of sewage that can be treated. Control of I/I issues is crucial to maintaining the capacity of both the sewer lines and the treatment plant.

Assessment

BWM has spent considerable effort to bring sewers to the areas that were severely septic polluted. The completion of the Wastewater Facilities Plan for the Towns of Holden and West Boylston, and

the approval of a funding program totaling \$78 million, is a very significant accomplishment. It is estimated that, upon completion of construction in 2004, 40% of the approximately 10,000 on-site wastewater disposal systems in the watershed will be connected to the sewer system. The new sewer system coverage in Holden and West Boylston coincides with subwatersheds most severely impacted by on-site wastewater disposal based on BWM's septic severity rating system stream classifications.

Approximately 2,200 watershed residents in Holden and Rutland already are connected to sewers built by MDC in the 1930s. Based on the on-going sewer system expansion in Holden and West Boylston, an additional 3,600 lots will connect to sewers. The Bureau will track the hook-ups to the sewers in order to help maximize the number of homes within the service areas that are connected to the sewers as they become available.

There are currently an estimated 10,200 on-site systems serving an unsewered population of about 28,000 within the Wachusett Reservoir watershed. After completion of the sewers, approximately 60% of watershed residents will remain served by an estimated 6,600 on-site systems. The completion of the municipal sewer systems currently under construction will enable BWM to focus wastewater efforts on the remaining moderately impacted acres and the areas less impacted by wastewater.

Control Approach

Goals

- To protect existing high-quality water resources from degradation due to wastewater disposal in the watershed system.
- To minimize through education and outreach the potential impacts of wastewater disposal on the waters of the watershed system.

Objectives

- Complete construction of the Holden-West Boylston Sewer Project on schedule.
- Assess impacts of the eliminated septic systems on tributary water quality.

Action Items

- Complete Final Phases of sewer project in Holden and West Boylston.
- Track connections to new sewer lines.
- Implement Worcester sewer system improvements.
- In conjunction with routine water quality monitoring, assess impact of sewers on water quality, and prepare periodic reports.
- Assist Rutland and Holden with Infiltration/Inflow (I/I) Reduction Programs.
- Evaluate I/I and sewer condition of BWM Rutland-Holden trunk sewer.

6.1.2 On-site Treatment

Accomplishments:

- Innovative systems piloted for existing homes in areas that are not in sewer service area and cannot accommodate Title 5 system.
- Septic system information from watershed towns collected and entered in electronic database system

Assessment:

Existing environmental regulations for on-site wastewater disposal are adequate to ensure water supply protection.

Key Actions:

- Continue water quality monitoring program and Environmental Quality Assessments to monitor for impacts from problem systems.
- Work with local Boards of Health and the DEP to see that Title 5 is strictly enforced in watershed communities.

Background

The principal body of regulations governing the design, installation, operation, and maintenance of on-site wastewater disposal systems in Massachusetts is Title 5, codified at 310 CMR 15.000. Title 5 is promulgated and administered by DEP and at the local level by the boards of health (BOH).

Under the current institutional and legislative arrangements governing on-site systems, BWM has focused its resources on:

- Identifying problem areas (using water quality monitoring and Environmental Quality Assessment data (**see Section 5**).
- Referring enforcement issues to the appropriate BOH and/or DEP office.
- Providing technical assistance to BOHs and property owners.
- Prioritizing areas in need of facilities planning and sewer construction, as with the Holden-West Boylston Sewer Project (**see Section 6.1.1**).

Current Program and Accomplishments

The 1991 Plan and 1998 Update identified a range of measures to be undertaken concerning on-site septic systems, such as:

- Provide technical assistance to BOHs to repair and/or replace failing systems and ensure strict enforcement of Title 5.
- Develop model BOH regulations.
- Limit density of new on-site systems through the WsPA.
- Provide information on septic system maintenance to BOHs and homeowners.

The Bureau has made substantial progress on each of its objectives. BWM put significant effort into establishing effective working relationships with local BOHs and initiating an evaluation of

alternative institutional mechanisms for management of on-site systems. MDC also completed three projects to assist watershed communities with on-site waste-water disposal.

MDC conducted a legal and technical analysis to identify alternative approaches for local wastewater management districts. A district approach could yield considerable benefits to BOHs and individual property owners, ensuring maintenance, inspection, pumping, repair or replacement, and system upgrades. A product of this effort was a framework for a legislative petition to create a wastewater management district that could be established on a regional, town wide, or neighborhood scale. This template is available for implementation by the watershed communities.

MDC funded the design and installation of five on-site systems using alternative technologies to demonstrate the systems' applicability, reliability and cost efficiency. The systems installed included FAST system, Waterloo Biofilter, Jet aerobic, Jet aerobic and sand filter, recirculating sand filter, and intermittent sand filter. The systems, installed in 2000, are currently being evaluated.

MDC identified the need for better and more accessible information on septic systems. DWM worked with the watershed BOHs to enter information into an electronic database. DWM engaged the services of a consulting firm to identify a suitable database program, inventory local parcel data from town records (including the BOH and Assessors offices), create a database for each town, link the parcel information to the BWM GIS system database, and install the program and provide training to town and BWM personnel.

Assessment

On-site wastewater disposal can be an accepted method of wastewater disposal in a water supply watershed, provided that such systems are designed, operated, and maintained in compliance with the Title 5 requirements, and that water quality is not impaired. Within those portions of the watershed expected to continue using on-site systems, there are a few individual lot and isolated neighborhood trouble spots. The BWM will address any potential problems on a case-by-case basis with the local boards of health.

Most on-site septic system issues are sufficiently controlled by Title 5. The 1995 revisions to Title 5 represented a major improvement to regulating on-site systems. In cases of a significant failure (e.g., surficial failure or obvious water quality impact), Title 5 has provisions for immediate action and enforcement. Title 5 also allows for the use of alternative technologies in cases where, due to lot size or soil conditions, individual lots cannot replace a problem system with a conventional system in conformance with Title 5. Title 5 also addresses less obvious or visible problems with existing systems by requiring inspections and system repairs with property transfers. Finally, both Title 5 and the WsPA prevent the construction of new on-site systems in sensitive areas (e.g., within 200' of a tributary to a water supply).

Property owners, town boards, DEP, and BWM each have a role in the proper control of wastewater in the watershed. Together, these entities are responsible for implementing several elements of a comprehensive, watershed-based approach to on-site wastewater management (**see Table 6-1**).

**Table 6-1
Responsibilities in On-Site System Management**

Management Issue	BWM	DEP	BOH	Property Owner
Monitoring & Identifying of Problem Systems	✓		✓	
Title 5 Administration		✓	✓	
On-Site System Operation & Maintenance				✓
On-Site System Repair & Replacement				✓
Septage Disposal & Accounting			✓	✓
Record-keeping & Reporting			✓	
Enforcement		✓	✓	
Public Education	✓	✓	✓	

Source: DCR/DWSP/BWM

The experience gained by BWM over the past ten years through its working relationships with DEP and the watershed towns' boards of health serve as a good foundation for continued success in dealing with an issue of continuing concern in the Wachusett Reservoir watershed. The Pilot On-site Remediation Program has installed alternative septic technologies in the watershed to encourage, by example and assessment, the use of these and similar systems to remediate sites where conventional septic repairs have been difficult or impossible to facilitate. Educational material on the application and operation of innovative systems in soil conditions typically found in Wachusett Reservoir watershed will be developed as staffing resources permit and operational and monitoring data become available over the next few years. The On-Site Wastewater Management District study provides a framework for an alternative approach to maintenance, inspection, repair, and replacement of septic systems in the watershed.

The septic database project has computerized available septic systems records in the watershed communities. This effort provided useful information on areas where high groundwater, poor soils, frequent pumping, and failing septic systems point to needed remediation. Each local board of health will decide whether to utilize the system and keep their town's records up-to-date.

Control Approach

Goals

- To protect water resources from degradation due to on-site wastewater disposal in the watershed.

Objectives

- Identify potential problems with on-site wastewater disposal.
- Work with local Boards of Health and DEP to resolve any problem sites.
- Ensure that on-site systems in the sewer service areas are connected in a timely manner.

Action Items

- Continue to review routine water quality data for any evidence of potential problems with on-site systems.
- Review local records, water quality data, and other pertinent information in conducting Environmental Quality Assessments to identify potential problem sites or areas.
- Provide assistance, as requested, to local boards of health on wastewater disposal issues, such as alternative technologies, septic system Operation & Maintenance, and local and regional management alternatives.
- Continue to monitor Alternative/Innovative systems installed in BWM pilot program.
- Utilize Septic Database System to develop statistics based on subbasin, type of system and age, as well as information pertaining to problems, repairs and Title 5 replacements.

6.2 Stormwater Management

Accomplishments:

- Implemented BMPs at critical sites around the reservoir.
- Supported non-structural initiatives, including advising local officials, coordination with DEP on Stormwater Advisory Committee, and attendance at public workshops on Phase II regulations.
- Awarded a contract to Town of Holden to develop stormwater management regulations.
- Conducted stormwater quality monitoring to quantify stormwater pollutant concentrations and loads.

Assessment:

BWM has made significant progress dealing with a number of specific water quality threats, such as failing septic systems, potential releases of hazardous materials, and wildlife. As a result, stormwater, which can be considered a general category that encompasses all land-use generated pollutants, has become a high staff priority. Federal NPDES Phase II stormwater requirements have been established since the 1998 Plan was developed, and will provide an opportunity for a coordinated approach to address stormwater impacts.

Key Actions:

- Work with local towns to assist in preparing and planning for the required Phase II Pollution Prevention Plan and other stormwater management issues.
- Identify, design, and construct key structural BMPs on BWM property.
- Continue to work with the Massachusetts Highway Department and local highway departments to implement stormwater improvements when conducting projects under their control.

Background

Stormwater pollution is generated from two general sources, Point and Non-point sources; each poses different challenges to water quality protection. Point sources are discrete discharges of processed water that directly flow to a point through a conduit; there are no Point source discharges to the Wachusett Reservoir. Non-point sources of stormwater pollution are caused by the daily activities of people and animals in the watershed. Rainwater and snowmelt that contacts developed areas, roadways, lawns, farms, and construction/industrial sites can pick up pollutants that are carried to the reservoir.

Stormwater runoff is one of the most common causes of water pollution. Stormwater pollution is caused by so many different activities that traditional, “end-of-pipe” regulatory controls have limited effect. In order to minimize stormwater’s impact, there needs to be a clear definition of the pollutants of concern, the sources of these pollutants, and the available mechanisms to reduce the pollutants. Structural facilities and non-structural practices (operations and management) are the general categories of these available mechanisms, with education and outreach as key components to a successful watershed-wide stormwater program.

Sediment, excess nutrients, bacteria and pathogens (from human and/or animal sources), debris, hazardous wastes, thermal pollution, heavy metals, and road salts are the general list of typical pollutants of concern. The characteristics of each pollutant and the resource being protected is considered when assessing the relative importance or threat of these pollutants.

Natural landscapes allow rainfall and snowmelt to percolate into the soil, where it is used and slowed by the vegetation. When natural landscapes are developed, the density of the vegetation is reduced and the amount of impervious area increases, which causes increased stormwater runoff. In a natural woodland area, approximately 50 percent of rainfall will infiltrate into the soil and 10 percent will travel as runoff. In a densely developed landscape (80 percent impervious) the amount of infiltration is reduced to 15 percent, while the amount of runoff increases to 55 percent (DEP, 1997). When new construction is being planned, stormwater controls can be incorporated into the design to reduce the impact of the development, but in already built areas, implementing stormwater controls can only be retrofitted on a very limited basis into the existing landscape. The most visible example of water pollution is the discolored runoff from construction sites. A thousand times more sediment can be transported from a stripped construction area than from the same area when it was a woodland or meadow.

Further harm can be derived from the practice of piping the stormwater flow to a stream without treatment, which causes erosion of the natural stream channels. The volume of runoff from developed areas can be up five times greater than before the development occurred; this runoff has historically been piped directly to the streams. Stream channels are formed based on the flow characteristics of the storms that occur most frequently. Referred to as “bank-full condition”, this situation occurs in the Wachusett Reservoir watershed at approximately two and a half inches of rain in a 24 hour period. Less frequent, larger storms overflow the banks and are carried in the flood plain of the stream. The frequency increases for the stream to be subjected to flows that exceed the bank-full conditions when development occurs. In these situations, the vegetation along the streams is unable to withstand the erosive forces and the banks begin to erode. Once the vegetation along the

banks is removed, then the released sediment and nutrients turns the stream itself into a source of pollution.

Previous Watershed Protection Plans, in addition to addressing stormwater itself as a pollutant source, have included programs to respond to pollution sources that are subsequently transported to the reservoir in stormwater, such as failing septic systems, wildlife, and construction activities. Some of the strategies discussed in this section overlap with programs and activities discussed in other sections of this plan.

Current Program and Accomplishments

During the development of the 1998 WPP Update, Camp, Dresser and McKee completed the *Wachusett Watershed Stormwater Management Project* for the MDC. This project developed a comprehensive approach for the control and management of stormwater as a non-point source of pollution within the Wachusett Reservoir watershed. The project followed the BWM's three water quality objectives:

1. For subbasins with no known water quality problems, provide protection to insure no degradation.
2. For subbasins where water quality has been degraded, provide remediation to improve the water quality entering the reservoir.
3. Institute measures for prevention in advance of proposed development.

To prioritize the implementation and to optimize the proposed treatments to meet these objectives, the project modeled the subbasins using existing water quality data for particular pollutants of concern associated with stormwater (e.g., bacteria and nutrients). The Stormwater Management Project provided a collection of activities and Best Management Practices (BMPs), ranging from broad watershed wide non-structural practices to site specific structural activities. Many of these were incorporated into the 1998 Plan Update and its' five year Action Plan.

The parameters used to calculate estimates of the travel times throughout the Wachusett Watershed were calibrated in field tests by CDM in order to produce a map of the worst-case travel times to the reservoir. Two maps were completed, modeling travel time to the reservoir using wet season and dry season stream base flow conditions. The modeling was done assuming that a spill on land would contain enough volume to flow to a stream from anywhere in the watershed. Detention time within ponds and swamps was not included.

Many of the recommendations of this project have been completed and evaluated in the intervening period. Additional information collected during the Environmental Quality Assessments has helped prioritize these activities. Emphasis has been placed on stormwater sampling in order to provide clarification of pollution threats and the extent of these threats to the reservoir. Bureau staff initiated specific stormwater sampling to assess distinct concerns and also increased sampling during storm events through a cooperative program with the University of Massachusetts, Amherst.

Review of these data has reinforced earlier work pointing to the importance of stormwater relative to total pollutant loadings to the reservoir. An example of the changes in pollutant concentration in a stream during and following a stormwater event is shown in **Figure 6-2**. Phosphorus concentration

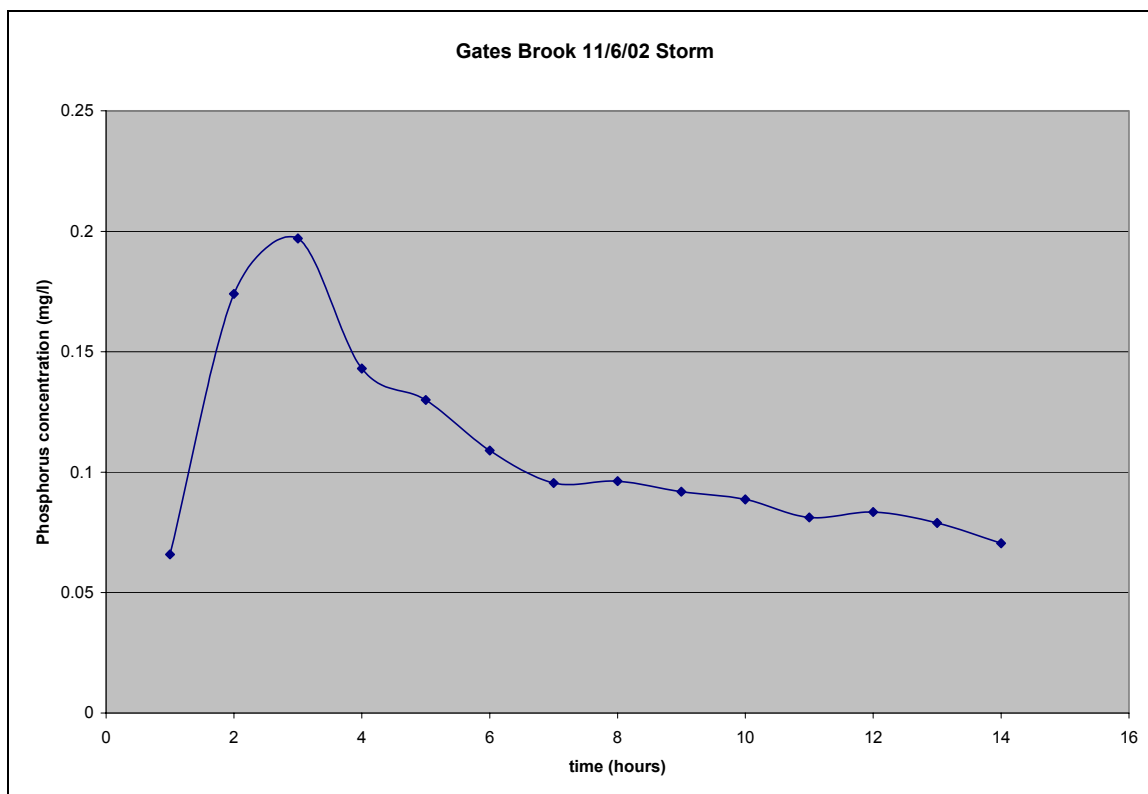
was measured in Gates Brook and is plotted over time using zero hour as the beginning of the rainfall. The graph illustrates a high concentration of phosphorus carried in the stream during a storm event.

A “Stormwater Project List,” as described in the 1998 Plan, was developed and has been updated to be used to inventory and prioritize projects recommended to remediate stormwater and improve safety and spill containment for highways and railways (**see Section 6.3**). Several Massachusetts Highway Department projects have been reviewed and monitored, including:

- Resurfacing of Interstate 190.
- Reconstructing the intersection of Route 140 and Dana Hill Road.
- Renovating two bridges along Route 140 in Princeton.
- Replacing culverts and drainage discharge piping throughout the watershed.
- Designing replacement bridges for the Stillwater River crossing on Muddy Pond Road in Sterling and the Quinapoxet River crossing of Mill Street in Holden.

Construction of stormwater controls in the area of the Cosgrove Intake are being implemented by MWRA in the fall of 2003, including the redirection of highway drainage from directly discharging to the Carville Basin to outside the watershed. The application of stormwater control BMPs at sites around the reservoir were planned and preliminary designs have been completed for the areas adjacent to the reservoir along Routes 140, 110, and 12 in Boylston, West Boylston, and Sterling.

Figure 6-2: Phosphorus Concentrations During A Storm Event



Source: DCR/DWSP/Wachusett EQ

Although staffing and budget limitations prevented the completion of the drainage structure mapping project identified in the 1998 Plan, many outlets and major hydrologic features were inspected and inventoried in the districts closest to the reservoir as part of the Environmental Quality Assessments (see Section 5.3). The Bureau intends to complete this mapping project using in-house capabilities.

Staff tracked and contributed to DEP's stormwater management projects through the DEP Stormwater Advisory Group. This group prepared a set of Model Bylaws and a Guidance Document to assist local communities with compliance with EPA Phase II requirements. The model presents the framework for bylaws to address Illicit Discharges, Construction Phase Erosion and Sediment Control, and Operation and Maintenance.

The Bureau has worked directly with the Town of Holden on stormwater issues. The Bureau awarded a Technical Assistance Contract in 2002 to the Town of Holden to create a set of "Unified Stormwater Management Regulations" (see Section 8.1). Holden intends that this project will help alleviate conflicting requirements between federal, state, and municipal regulations, and reduce excessive and differing standards for reviews between the board of health, planning board, and the conservation commission. The goal of this work is to produce a set of regulations that will clearly and effectively assure that development is conducted in a manner that will control stormwater flow rate and volume, and minimize degradation of water quality, and insure conformance with EPA Phase II requirements. This project is scheduled for completion by June 2004, and will also be available to be utilized as a model for other communities.

Filter Curtain Pilot Project

A major accomplishment was the completion of a pilot project involving the installation and monitoring of a filter curtain at Malagasco Brook Cove. This pilot project, partially funded through a grant from the EPA's National Risk Management Research Laboratory to assess innovative technologies, consisted of both a bench-scale and full-scale deployment of a Gunderboom Reservoir Particulate Control System (RPS™), developed by Gunderboom, Inc. The bench-scale component of the study was conducted by Wright-Pierce Engineers of Topsham, Maine, while the full-scale deployment was conducted at Malagasco Brook Cove in the Wachusett Reservoir. Each scale involved sampling and analysis during six different storm events.

The results of both the bench-scale and full-scale demonstration studies revealed that the filter curtain can effectively capture and retain the pollutants tested under various flow conditions that are within the filter curtain's design limitations. The filter curtain functions much like a detention basin in that the rate of inflow is considerably slowed down, allowing for increased settling of suspended particles within the enclosed area. An example of the results show the average reductions for fecal coliform bacteria were substantial, ranging from 78 to 98 percent in five out of six events that had valid data. The findings of this study indicated that use of the filter curtain technology could be an effective tool to protect the water quality in surface water resources, especially when combined with other storm water treatment devices used throughout the watershed. Long-term operations and maintenance costs have to be determined prior to considering installation at other suitable locations.



Filter curtain deployed at Malagasco Brook Cove.

Assessment

BWM has made significant progress dealing with land use and other activities that were the greatest concern to water quality in previous watershed plans. For this reason, stormwater management has been assigned a higher priority for staff resources. This promotion reflects BWM commitment to devote greater resources to the threats posed by stormwater, and does not indicate an increase in pollutants from stormwater.

Bureau concerns for structural controls focus on untreated direct discharges to the Reservoir, I-190 stormwater facility maintenance, and installation of site specific BMPs at selected sites in the watershed. Non-structural strategies to control stormwater impacts focus on coordination with municipalities. The revisions to the NPDES permitting (EPA Stormwater Phase II) has focused responsibility for coordination of control of stormwater pollution to towns and forces development of Stormwater Management Plans for the larger watershed communities. The coordination between the BWM and Mass Highway Department has greatly improved; most projects are currently informally presented to the Bureau at the early design stage, and the comments are incorporated into the designs, when possible. The MHD is also subject to the NPDES Phase II stormwater rules; this forum may be a useful tool to assist implementation of BMPs on MHD-controlled roadways.

The Bureau has developed a three tier approach to managing stormwater concerns focusing on protection, remediation, and prevention. The stormwater control work that has been conducted has demonstrated that effective, fiscally responsible initiatives must be implemented for specific pollutants that are causing documented problems within the reservoir. Successful implementation should focus on the following elements:

- **Public Education, Local Coordination and Technical Assistance:** Apply the proven water quality protection strategy of watershed-wide BMPs. Take advantage of opportunities provided by the revisions to the NPDES Phase II to enhance stormwater protection and monitoring by working with the applicable communities.
- **Studies and Investigations:** Collect and analyze data that are critical to the formation of effective stormwater control strategies. Topics to study can range from generalized water quality stormwater threats to specific pollutants and areas of concern.
- **Best Management Practices:** Design, permit and install structural BMPs on BWM-owned lands which are located by studies that assess optimal water quality protection benefits.

Control Approach

Goals

- To enhance the water quality reaching the reservoir through BWM-owned property.
- To assist local and state officials in taking responsibility for improving quality of local stormwater runoff.

Objectives

- Work with Mass Highway Department and local highway departments to improve water quality from road runoff.
- Support local measures that address stormwater and optimize opportunities to work with communities on stormwater management and planning.
- Continue research, and initiate appropriate new studies, to improve specificity in pollution control.
- Continue and refine stormwater sampling program and modeling efforts.
- Continue to install structural BMPs on BWM land.
- Integrate stormwater control efforts with other elements of the Watershed Protection Plan, including: Construction (Erosion and Sedimentation Control), Technical Assistance, Public Education and Community Outreach, and Research Projects and Special Studies.

Action Items

- Add additional stormwater sampling. Continue work with UMass to collect stormwater samples after hours.
- Add additional stormwater sampling specific sites to evaluate BMPs (before and after installation).
- Assess research needs relative to stormwater modeling and monitoring.
- Review MHD Phase II permit and meet to coordinate with appropriate MHD staff.
- Work with MHD specifically on I-190 basin maintenance.
- Work with local towns to assist in implementing the required Phase II Stormwater Management Plans.
- Provide technical assistance to towns, as requested, on issues such as stormwater bylaws.
- Develop revised list of projects for the 2004 – 2009 timeline that integrates water quality and resource considerations. Install one new BMP each year for next five years.
- Complete stormwater mapping for major conveyance structures in the watershed.

6.3 Transportation and Hazardous Materials

The Wachusett Reservoir watershed is not a remote, isolated area. Thousands of people live in the watershed; roads and railroads traverse the region and are significant watershed features. The impacts from daily transportation activities on water quality must be managed by the Bureau. The Bureau must be prepared to respond to accidents that might release hazardous materials or other pollutants into the reservoir. In light of heightened security concerns, the Bureau must also consider the possibility of deliberate releases and develop preparedness plans.

The strategies discussed here overlap with and are coordinated with activities discussed in the sections on stormwater and security (**see Sections 6.2 and 7.2**). The Bureau's goals for transportation related issues are:

- To improve the safety both of roads and railways, thereby decreasing the possibility of accidents occurring.
- To improve drainage structures to detain any materials spilled, and prevent or slow their reaching streams or the reservoir.
- To improve capability of local responders to respond to a spill. This includes providing training and equipment geared to the unique considerations should a major spill occur in the Wachusett Reservoir watershed.

6.3.1 Highways and Railroads

Accomplishments:

- Prioritized and implemented projects to improve operational and structural protection along highways and railways.
- Improved communication and coordination between the Bureau and among operators and regulators of roadways and railways.
- Provided public education materials for water quality risks associated with transportation activities.
- Monitored local and regional projects being conducted within the watershed.
- Designed the Cosgrove Intake/Rt. 70 Stormwater Project.

Assessment:

Transportation related runoff is a moderate threat, though spill/releases are a high potential threat (see Section 6.3.2). The most significant pollutants in runoff are heavy metals and petroleum products; less significant pollutants are sediments and pesticides/herbicides. Reducing the risk of accidents through the careful application of roadway salt was determined to be a significant benefit to the watershed; sodium from winter road run-off is a minor pollutant that does not impact water quality.

Key Actions:

- Coordinate efforts with State and local highway departments to improve operational and maintenance practices.
- Improve existing infrastructure to treat or redirect all direct discharges to the reservoir and incorporate Best Management Practices (BMPs) into new construction and improvements of existing roads.
- Map and monitor stormwater conveyance structures/systems.
- Continue to dialogue and determine management opportunities with the railroads for operational and maintenance improvements.
- Coordinate with active railroad companies on security and freight issues within state and federal guidelines.
- Complete the Cosgrove Intake/Rt. 70 Stormwater Project.

Background

Transportation related threats come from cars, trucks, or rail cars that traverse the approximately 350 miles of roads and 18 miles of railroad in the Wachusett Reservoir watershed. In order to construct Wachusett Reservoir, several roads and a railway were relocated. The relocated railways and

highways are in close proximity to the reservoir, and in some locations actually cross the reservoir, which increases the potential vulnerability of the reservoir to both accidents and daily run-off. Pollution threats from transportation activities include potential release of materials being transported as well as the materials used in the operation of vehicles, such as fuel and associated chemicals. The potential volumes, and thus potential risks, are much greater from release of the former. The BWM has pursued a multi-faceted approach to minimize the pollution threats associated with transportation corridors. This approach includes: identifying sources and transportation routes of Hazardous Materials, educating both transporters and the general public about the risks to the water supply and working cooperatively with local and state agencies on drainage improvements and emergency planning.

Current Program and Accomplishments

MDC engaged the services of the consulting engineering firm Rizzo Associates, Inc. to assist in developing a comprehensive approach to transportation threats. The results of the study, published in *Hazardous Materials Transportation Release Control Project* (Rizzo, 1998), have been used to guide the overall program in the Wachusett Reservoir watershed.

Highways

Roads and bridges in the watershed are owned and maintained by the Massachusetts Highway Department (MHD), local municipalities, and the BWM. MHD controls most of the major highways, although portions of some of the highways may be under local control. BWM has developed a good working relationship with MHD. The Bureau reviews highway projects for impact on watershed resources and offers suggestions and designs for incorporating BMPs to minimize stormwater. In 2001, all guardrails on the MHD roads surrounding the Wachusett Reservoir were replaced with stronger guardrails (see **Figure 6-3**). BWM assisted MHD by developing specifications for this project that could meet MHD and BWM needs. 6,900 feet of reinforced guardrail were installed surrounding the Wachusett Reservoir along Routes 70, 140, 12, and 110. The standard guardrails removed in the process were re-used by BWM to limit access in prohibited areas in the watershed and to replace older guardrail in other areas of the watershed not adjacent to the Reservoir.

Figure 6-3: Example of Guard Rail Replacement



Rt. 70

Old



New

Structural controls have been implemented in key areas to reduce the likelihood of spills reaching the reservoir, and are summarized in Table 6-2.

Railroads

There are two major railroad lines in the Wachusett Reservoir watershed: Providence & Worcester and Guilford Transportation. The most crucial piece of rail line is the 7.5 miles of track owned by Guilford that traverses the western perimeter of the Wachusett Reservoir. BWM has an ongoing dialogue with the railroad companies to ensure that their cargo is safely transported through the watershed. Sharing data on the hazardous materials carried over these tracks is a particularly sensitive issue for the railroad companies. BWM and MWRA have worked with EOE and the railroad companies to obtain this information in order to be prepared for any potential emergency.

Recent repairs to the railroad bridge over the Stillwater River and adjacent to the Thomas basin is an example of the relationship between the BWM and the railroad companies. BWM inspected this bridge, owned by Guilford Railroad, early in 2002. The Bureau noted a rail misalignment with settling of ballast along the line at the bridge. The area was subsequently inspected by Guilford personnel and the rail was aligned and additional ballast was placed.

The Department of Agricultural Resources administers the Right-of-Way Management Regulations (333 CMR 11.00) that affect the railroad and utility companies. These regulations proscribe setback requirements from drinking water supplies for the application of pesticides. The Pesticide Board, which has authority to enforce this law, has been in the midst of revising these regulations due to requirements set forth in the Commonwealth's May, 2000 "Act to Protect Children and Families From Harmful Pesticides." BWM and MWRA staff have been actively involved in reviewing and commenting on the revised regulations, ensuring the maximum benefit to water quality from this law (also see Section 5.2.3). The railroads Yearly Operating Plan and five-year Vegetation Management Plan are closely scrutinized by BWM to ensure proper setbacks from tributaries in the watershed system.

Assessment

In general, runoff from highways and railways is a low to moderate threat, however an accidental spill or other release of hazardous materials is considered a high potential threat. The most significant pollutants in runoff are heavy metals, petroleum products, and potential chemical contaminants. Less significant are sediment and pesticides/herbicides.

There have been public concerns regarding sodium from roadway de-icing. Elevated sodium is more commonly found in groundwater than surface water. Water quality testing has not shown sodium in Wachusett Reservoir water in detectable concentrations. MWRA also measures sodium monthly in the finished water. The levels are very low and there is no public health risk. It was determined, therefore, that the benefits of road salting in winter conditions – reducing the risk of accidents along the roadways and decreasing the potential for spills caused by accidents – when done in a careful manner, outweighs its impact on water quality.

BWM has built upon the *Transportation Release Controls Study*, working with local communities, MHD and rail carriers on improving drainage infrastructure so that pollutants are removed from stormwater prior to discharge to the reservoir or its tributaries. The drinking water and transportation agencies gain mutual benefits by increasing the safety of highway and railway corridors, which in turn minimize the opportunity for accidental spills. Section 6.3.2 discusses emergency response planning.

Control Approach

Goals

- To make improvements in the safety of the transportation corridors by structural and operational enhancements, minimizing the threat from accidental releases.
- To improve existing drainage infrastructure to minimize pollutants that are discharged with stormwater to the reservoir or its tributaries.

Objectives

- Work with MHD, railroad companies and local communities to improve road drainage, maintenance and safety conditions.

Action Items

- Coordinate efforts with State and local highway departments and railroad companies to improve operational and maintenance practices.
- Advocate for State and local highway departments to include Best Management Practices (BMPs) into new construction or improvements of existing roads in order to treat or redirect all direct discharges to the reservoir.

6.3.2 Hazardous Materials Emergency Planning and Response

Accomplishments:

- Reviewed Federal and State databases of USTs/ASTs, hazardous materials generators, and fixed site and transportation-related spills/releases.
- Established BWM's position and responsibilities within the communication system and incident response efforts with state and local emergency personnel.
- Purchased and established mobile units and supplemented supplies for all communities for HazMat Emergency Response.
- Coordinated with State and local agencies to improve coordination of emergency response planning within watershed.
- Provided Emergency Response training for BWM staff and local fire departments.
- Provided public education materials for health risks associated with accidental hazardous material releases.
- Deployed emergency spill containment equipment at BWM and local fire department sites.

Assessment:

The level of threat from an accident involving hazardous materials depends on the type and volume of the product released, the location of the incident, and weather conditions. The most critical areas are within and adjacent to the reservoir, which also have the highest volume of hazardous material transportation.

Key Actions:

- Refine participants and responsibilities in the Hazardous Materials Emergency Response.
- Support training and equipping of BWM staff and local responders.
- Coordinate drills and communications to maintain and improve cooperation among State and local responders.
- Prepare and maintain plan that prioritizes responses on BWM property, and assist communities with update and preparation of their Comprehensive Emergency Response Plans.
- Coordinate with active railroad companies on security and freight issues within state and federal guidelines.

Background

Release of hazardous materials along the Wachusett Reservoir watershed's transportation corridors has consistently been considered a high potential threat to water quality. The 1998 Plan reassessed the threat posed by releases from contaminated sites to low due to, among several factors, the small number of fixed sites in the watershed and that these sites are permitted and regularly inspected (**see Section 5.2.2**). This section specifically addresses emergency response planning associated with the threat of transportation related accidental spills or releases of hazardous materials.

Current Program and Accomplishments

A Hazardous Materials Emergency Response Study, commissioned by the Bureau in 1997, developed a comprehensive response plan that has been implemented during the past five years. The study determined that the greatest benefits to response capacity would be achieved by improving the existing responders' resources (i.e., local fire departments' equipment and training). The Bureau also monitors a DEP database of generators and volumes of hazardous materials to help with this emergency planning.

Local Coordination

BWM has coordinated several meetings of agencies and industries having an interest in emergency response planning in central Massachusetts. Representatives from the local Fire Departments, railroad companies, Federal Railway Administration, Federal Emergency Management Agency, MA Emergency Management Agency, MWRA, State Police, BWM, and EPA have attended BWM sponsored meetings. In November, 2002, twenty-five Fire Chiefs, Hazardous Release Response Coordinators, Local Emergency Planning Commission members, and Town Administrators attended a half-day training sponsored by the BWM. Presentations from DFS/Emergency Response, Providence & Worcester and Guilford Railroads, MEMA LEPC Action Plan Update Process, MA Firefighting Academy, and BWM covered each agencies responsibilities, contributions, and

limitations in the event of a release. Information was distributed listing each agency's available equipment and expertise, typical response procedures, and additional training opportunities.

The Bureau entered into a Memorandum of Agreement with the Wachusett Reservoir watershed communities' Fire Departments for Boat Use and Maintenance. This MOA will provide the communities with access to a functioning boat for emergency operations and helps protect the interests of the Bureau if a spill occurs in or near a water body.

The Household Hazardous Products Committee, a consortium of Wachusett Reservoir watershed communities hosted by the Town of Sterling, received \$25,000 in 1999 for an educational and public awareness program. These funds paid for the set up fees for four hazardous waste collections. The program enabled the Town to hire a consultant that provided numerous educational programs throughout the region. Sixteen in-class presentations were made at schools in Paxton, Rutland, Holden, Sterling and Princeton. Three presentations were also made at local Lions Clubs and the Wachusett Rotary club. These presentations focused on the use of alternatives to hazardous products.

Hazardous Material Emergency Response Equipment

In coordination with the MWRA, BWM staff has obtained materials that will be made available in trailers to local responders in the event of a hazardous material release on land, in a tributary or on the reservoir itself. The equipment has been specified to augment the existing supplies of the local responders for the specific needs associated with the fact that they are tributary to a drinking water supply.

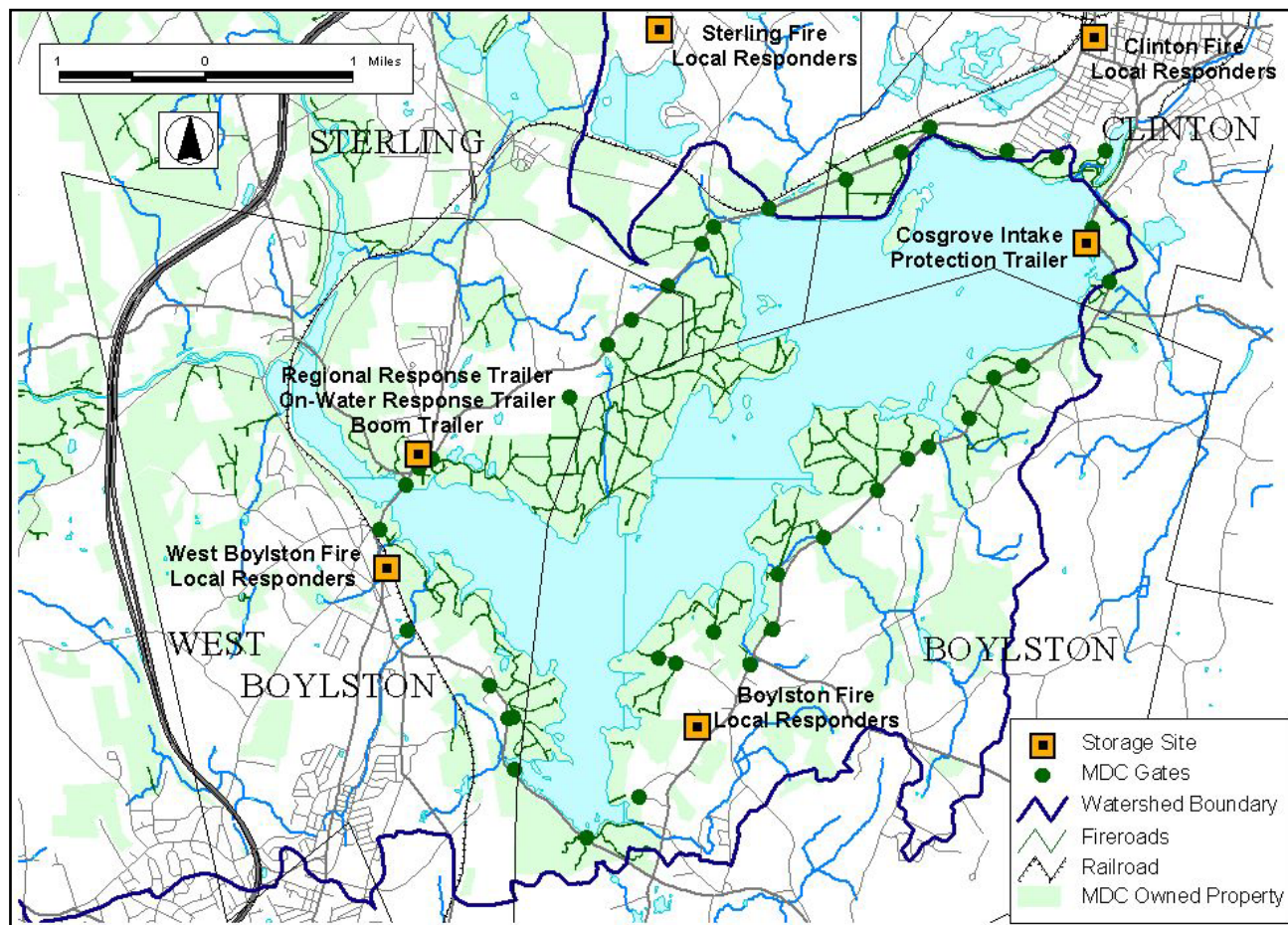
Four trailers and appropriate equipment have been positioned in key locations around the Wachusett Reservoir. Local responders are equipped to drive to these locations and connect the trailers to a truck and take the trailers to the emergency site. There are four distinct emergency response trailers: a Regional Response Unit, On-Water Response Unit, Boom Trailer, and an Intake Protection Unit (see Figure 6-4).

Spill containment equipment is also being purchased and will be housed at the Cosgrove Intake Area which will be used to impede floating materials from coming within 150 feet of the intake. An emergency spill containment system was installed at the BWM boat cove to block the transport of buoyant materials out of the cove.

The Bureau conducted in-house training for communications staff to afford them Emergency Response-Awareness level certification. Field staff received training and certification to the Emergency Response-Operations Level. This training consisted of eight hours of classroom instruction in personal safety, threat identification, emergency notifications and procedures, a tabletop exercise, and exam. The Bureau also conducted Incident Command Training for all staff to make them aware that the process existed, how it works, and how they fit into the response system.

Three local fire Chiefs and deputies, and a BWM staff member attended a mock response action at MWRA's Deer Island Facility in Boston. They deployed, anchored, and retrieved 1,500 feet of containment boom similar to what may be needed in the event of a release in the reservoir.

Figure 6-4: Emergency Response Equipment Locations



Local Spill Kits

The purchase of hazardous materials emergency response equipment (Spill Kits) was completed and distributed to all the communities in the Wachusett Reservoir watershed. The equipment will enable watershed towns to respond to a maximum of a 2,000 gallon petroleum product release, and provides personal protective gear for the response.

Assessment

The Bureau prioritizes the level of water quality threat by an accidental spill or release based on several factors, including: the specific product that was released, the volume of product released and the location of the incident. The impact of a spill or release would be most critical in the Reservoir Basin, less critical in the Central Basin (upstream of the Rt. 12 causeway), and least critical in the Worcester Watershed Basin. The roads with the highest volume of hazardous materials in the Wachusett Reservoir watershed, however, are located in close proximity to the reservoir itself.

BWM has made considerable progress in augmenting the resources available to the region's first responders. Ongoing planning, communication and training exercises will further complement the preparedness of all those who are responsible for emergency response in the watershed.

Control Approach

Goals

- To ensure prompt, effective response actions to accidental spills or releases of hazardous materials.
- To reduce the volume of hazardous materials in the watershed.

Objectives

- Maintain and improve capabilities of all emergency responders in the watershed for hazardous materials spills or releases.
- Maintain information about hazardous material use in the watershed.

Action Items

- Refine participants and responsibilities in the Hazardous Materials Emergency Response.
- Support annual training and equipping of BWM staff and local responders. Coordinate drills and communications to maintain and improve cooperation among State and local responders.
- Prepare and maintain plan that prioritizes responses on BWM property, and assist communities with update and preparation of their Comprehensive Emergency Response Plans.
- Coordinate with active railroad companies on security and freight issues within state and federal guidelines.

6.4 Other Pollution Sources

The 1991 Plan identified a variety of potential sources of contamination and prioritized their threat level. Many of these potential sources were ranked low, or were subsequently reduced to a low priority by the 1998 Plan Update, due to the control programs in place. The Bureau's monitoring programs (**see Section 5**) provide many of the measures necessary to control the following sources of pollution:

- Gas/Petroleum Storage
- Road Salting
- Gravel Mining
- Solid Waste Facilities
- Groundwater Discharges
- Hazardous Waste Generators
- Uncontrolled Releases from Fixed Sites.

This section describes the few remaining land uses that are either a medium priority, have been reduced to a low priority by the Bureau, or have consistently maintained a low priority but nevertheless require staff resources.

6.4.1 Construction (Erosion and Sediment Control)

Accomplishments:

- Continued to work with local Boards in reviewing development projects.
- Monitored active construction sites.
- Completed Construction Guidelines for in-house review of development plans.
- Reviewed erosion and sediment controls as part of the Watershed Protection Act application process, including plan review, meetings with developers and on site inspections.
- Acquired lands sensitive to erosion in the watershed.

Assessment:

BWM staff spends a significant amount of time reviewing site plans, meeting with developers and monitoring construction sites to implement actions that prevent sediment from entering resource areas.

Key Actions:

- Continue reviewing site plans and meeting on site with developers to discuss erosion and sedimentation controls.
- Implement monitoring program for active sites.
- Pursue compliance and enforcement of all appropriate environmental regulations.

Background

Construction poses a pollution threat from site erosion into resource areas. Authority to prevent such erosion can be found in a number of regulations, including the Watershed Protection Act (350 CMR 11.00), the Wetlands Protection Act (310 CMR 10.00), the Massachusetts water quality standards (310 CMR 4.0), and BWM regulations (350 CMR 11.09).

Current Program and Accomplishments

Environmental Quality staff attempts to minimize erosion by reviewing construction projects before they start. The Watershed Protection Act, which allows review of projects in affected areas, is the Bureau's major tool to accomplish this task. Projects that are not subject to the Watershed Protection Act may also be of concern. In this case, staff works with the local boards, generally the conservation commission, to see that resources are protected. Staff conducts site visits when a project is submitted, and evaluates the controls presented in the site plan. During construction, additional site visits are conducted to ensure that controls are constructed and working as designed. If problems are noted, BWM staff works with the property owner and local officials to install corrective measures.

Assessment

Erosion of sediment into watershed resource areas can cause serious environmental problems. Erosion from construction sites results in loss of resource areas and is harmful to wildlife. BWM staff work diligently to minimize erosion by reviewing sites prior to the start of construction. Problems often arise because proponents do not follow the erosion and sediment controls agreed to when the site plan was reviewed. Although some property owners are cooperative, the threat of enforcement is sometimes needed to ensure that corrective actions are taken. If problems occur on a site that is subject to the Watershed Protection Act, BWM can take direct action based on these regulations. If problems occur on a site that is not subject to the WsPA, BWM will coordinate with the conservation commission, asking them to take the lead on enforcement. If the conservation commission is not able or does not want to take enforcement action, BWM can proceed using 350 CMR 11.09, the general watershed protection regulations.

Control Approach

Goals

- To minimize erosion and sedimentation from active construction sites in the Wachusett Reservoir watershed.

Objectives

- Provide input to projects at design stage in order to minimize potential for erosion.
- Actively monitor sites to ensure that site controls are implemented and maintained.
- Take appropriate corrective and enforcement action when erosion into resource areas is found.

Action Items

- Continue to review projects through WsPA, working with conservation commissions and other local boards.
- Monitor active projects through on site inspections and water quality testing.
- Pursue compliance and enforcement of all appropriate environmental regulations.

6.4.2 Agriculture

Accomplishments:

- Implemented BMPs at seven priority sites through a grant by the USDA Natural Resources Conservation Service (NRCS) that was administered by the MA Dept. of Food and Agriculture (DFA).
- Initiated negotiations for BMPs on two additional sites.

Assessment:

There are few farms remaining in the Wachusett Reservoir Watershed due to sales and conservation acquisitions. BWM's collaboration directly with farmers and with other agencies that support agriculture, such as the DAR and NRCS, has helped to minimize the impact the remaining farms have on water quality in the Wachusett Reservoir.

Key Actions:

- Monitor agricultural impacts through EQAs; follow policy to contact agricultural land owner if there is a violation of watershed regulations.
- Update status of sites identified as most important in 1998 Plan. Evaluate effectiveness of installed BMPs.
- Identify and locate new hobby farms.
- Assess opportunities to educate hobby farm and nursery/landscape operators on water quality issues.
- Coordinate with DAR and EOEa to integrate water quality objectives into their agricultural outreach materials.

Background

From the period of its initial development as a water supply through the 1950s, agriculture was the principal land use in the Wachusett Reservoir watershed. BWM's regulations reflect a concern regarding agricultural activities:

- 350 CMR 11.09 states that "No person shall...construct, establish or maintain any agricultural facility or place where animal manure may be deposited or accumulated without adequate provision to prevent any manure or other Pollutant from flowing or being washed into the Waters of the Watershed System."
- 350 CMR 11.04 prohibits the outdoor storage of fertilizers, herbicides, pesticides, and manure within certain areas of the watershed.

Since the end of World War II, the number of active farms in the Wachusett Reservoir watershed has declined, similar to trends seen in other areas of the Commonwealth. Agriculture operations comprise a small portion of the watershed land use. In the 1998 Plan, MassGIS land use data from 1992 showed that agriculture makes up 3% of the total Quabbin Reservoir watershed land use, 5% of the total Ware River land use, and 8% of the total Wachusett Reservoir watershed land use. Using updated 1999 land use data, agriculture now comprises 7.2% of the land use of the Wachusett Reservoir watershed. These land use figures overstate the extent of agriculture, because many of the areas defined as agriculture on the land use GIS coverage (based on photo-interpretation) are not being actively farmed. The actual percentage in the Wachusett Reservoir watershed, based on BWM staff observation, may be less than 5%.

Current Program and Accomplishments

The 1998 Plan considered potential water quality threats from agricultural practices under two categories: Herbicides/Pesticides/Fertilizers usage, and Livestock & Crops. These categories were assessed as High Potential Threats to water quality. The Plan proposed a cooperative approach, working with other state and federal agencies, including Massachusetts DFA and the USDA NRCS.

Twelve farms were identified by MDC/DWM in 1998 as the most significant agricultural operations in the watershed. In the spring of 2000, MDC offered financial assistance (\$45,000 in grants) for ten best management practices (BMPs) on seven sites. The DFA and NRCS offered assistance (\$30,000) for seven BMPs on two of the same and one additional site. Nine of the BMPs have been completed at a cost of \$48,000; the remaining eight are still under construction (**see Table 6-2**). Water quality improvements have also been made at some of the other farms without assistance from other funding sources. Targeted monitoring has not been conducted at these sites; impacts are being identified through routine Environmental Quality Assessments (**see Section 5.3**).

BWM has worked with its sister EOEAs on a variety of fronts dealing with agriculture and water quality issues. The Bureau has coordinated with DAR in several ventures, including participation on the Agricultural Advisory Group, an exploration of ways to promote composting for small scale farms, and identification of agricultural land for non-BWM protection. DEP developed some educational materials for horse owners that the Bureau can utilize for its educational purposes. The Water Resources Commission produced a “Guide to Lawn and Landscape Water Conservation” in 2002 which identifies a myriad of management solutions to water use, including limited use of chemicals; several of these tips were included in a Watershed Protection Act brochure on landscaping (**see Section 5.2.1**). The Bureau continues to investigate potential agricultural BMP with other water suppliers and professional organizations.

Assessment

Many watershed residents consider farming a community resource that is an important component of community character, as well as a help to preserve open space. As much as it is a cherished part of the landscape, farming can have negative impacts on water quality. BWM’s goal is not to eliminate agriculture but to control the greatest threat to water supply posed by these activities, which is contamination from animal wastes containing pathogens. Assessment of actual risk is very complicated due to the many unknowns about transport, fate, viability, infectivity, dosage, problems with existing testing methods, and other factors that must be considered to evaluate actual risk posed by livestock. Other pollutants, including nutrients, pesticides, and suspended solids, may be generated by livestock, crop production and nursery/landscape operations. These compounds all pose a potential threat to water quality, but are considered a lesser health risk than pathogens. Overall, however, agriculture that is properly conducted should pose a very limited risk to water supply.

Agricultural use is dynamic. The survey conducted by CEI for MDC is a “snapshot” of activities in the watershed circa 1997. These data does demonstrate, however, that the majority of farms in the Wachusett Reservoir watershed are small-scale operations. Few farms have more than 100 animals; many can be considered “hobby farms” or “gentleman farms.” The Bureau needs to develop a process to identify and locate all of the minor agricultural uses in the watershed. It is also important

to note that most of the larger farms are located in the Worcester sub-watershed, which is the area most remote hydrologically from the reservoir.

Table 6-2
Status of Priority Agricultural Sites in the Wachusett Reservoir watershed – March 2002

TOWN	ADDRESS	BMPs	COST	STATUS
Boylston	Diamond Hill Ave.	▪ Fencing	none	No activity.
Holden	Manning St.	▪ Fencing	\$1,000	Complete.
	Bond Rd.	▪ Fencing and seeding ▪ Manure storage	\$28,000	Fencing and seeding complete; ramp to manure pit needed.
	Malden St.	▪ Roof for manure storage ▪ Sand filter	\$8,000	Complete; additional fencing also installed.
	Bryant Rd.	▪ Fencing ▪ Watering device	none	No activity.
Rutland	Glenwood Rd.	▪ Manure storage pad ▪ Fencing	\$3,800	Incomplete – delay due to fire at farm.
	Muschopauge Rd.	▪ Manure storage pit ▪ Fencing and seeding ▪ Filter field ▪ Barnyard management ▪ Gutters	\$17,500	Complete.
	Hillside Rd.	▪ Fencing	\$2,200	In progress.
	Maple Ave.	▪ Fencing ▪ Pad and roof for manure storage	\$8,000	Storage to be designed by NRCS.
Sterling	Lucas Rd.	▪ Filter strip ▪ Roof for manure storage	none	Complete; self-funded
West Boylston	Prospect St.	▪ Manure storage pad and roof ▪ Fencing ▪ Watering device	\$6,500	Fencing complete; remaining BMPs in progress.
	Valley Forge Cir.	▪ Sand filters	none	No activity.

Source: DCR/DWSP/BWM EQ, 2003

The 1998 Plan focused on potential pathogen contamination and placed agriculture on a higher level of concern than in 1991. BWM dedicated significant resources to working with farmers and federal and state agricultural agencies to correct water quality problems related to agricultural practices. Combined with the continuing decline of farm and agricultural operations, agriculture has been reduced to a low priority threat.

BWM has developed and implemented a policy for working with land owners to correct water quality problems caused by agricultural operations. BWM staff have visited and inspected the most significant farms in the watersheds. The policy is summarized below:

- BWM staff are alerted to a potential problem via a complaint, as a follow-up to water quality

sampling results, or as part of routine Environmental Quality Assessment. An appointment to visit the site is made with the landowner.

- BWM staff visit the site to investigate potential causes of the observed problem, and explain BWM concerns to the landowner. Staff evaluate conditions as they relate to BWM regulations to determine if there is a violation of the regulations.
- If a violation of BWM regulations is noted, staff explain to the landowner that a Notice of Violation will be issued by BWM.
- BWM staff contact NRCS, and arrange to make a follow-up, cooperative visit by BWM and NRCS staff. Corrective actions, including agricultural BMPs are suggested. NRCS informs the landowner of any available funding sources for the corrective measures.

Control Approach

Goals

- To minimize the potential for agricultural wastes and chemicals to leave the source and to enter tributary waters of the reservoir, focusing first on pathogens.

Objectives

- Collaborate with landowners and appropriate state and federal agencies to develop cooperative solutions to agricultural-related water quality problems.

Action Items

- Monitor agricultural impacts through EQAs; follow policy to contact agricultural land owner if there is a violation of watershed regulations.
- Update status of sites identified as most important in 1998 Plan. Evaluate effectiveness of installed BMPs.
- Identify and locate new hobby farms.
- Assess opportunities to educate hobby farm and nursery/landscape operators on water quality issues.
- Coordinate with DAR and EOEA to integrate water quality objectives into their agricultural outreach materials.

6.4.3 Private Forestry

Accomplishments:

- Provided technical and monetary assistance to landowners to develop Forest Management Plans for their private properties

Assessment:

Thirty four Forest Management Plans, totaling 2,115 acres, have been funded on the Wachusett Reservoir watershed. These management plans provide additional measures of watershed protection by promoting properly designed timber harvesting practices on private lands. The Chapter 61 program, which provides tax benefits to owners of forested or agricultural lands who register their property, is an important conservation tool.

Key Actions:

- Provide public education/technical assistance to private landowners to develop land management plans and enter Chapter 61 programs.
- Maintain inventory of Chapter 61, 61A protected lands, assess management practices, and work with owners where needed.
- Continue periodic review of forest cutting plans and private forestry practices

Background

The Bureau started a program of direct technical assistance in 1995 to forest landowners at the Wachusett Reservoir watershed. At that time, there were over 26,000 acres of unprotected forest lands in the watershed. A Private Lands Forester was hired using funding provided jointly by MDC/DWM and the USDA Forest Service (in conjunction with the Department of Environmental Management). The need for a Private Lands Forester had been identified in the Quabbin Land Management Plan. This forester assisted DEM foresters in administering MGL c. 132 –the Forest Cutting Practices Act –in the Wachusett Reservoir watershed. Other duties included providing outreach to private landowners to encourage land protection through programs such as Chapter 61 and the Forest Stewardship Program. As recommended in the 1991 Watershed Protection Plan, the forester also encouraged general use of the Bureau’s Conservation Management Practices for forestry operations on watersheds. The Private Lands Forester worked to encourage private landowners to manage their forests and wildlife to meet watershed-wide goals, looking beyond their individual property boundaries and designing management strategies that address the issues of the larger ecosystem.

Current Program and Accomplishments

In order to increase landowner participation in Chapter 61 and the Stewardship programs, the Bureau contracted to hire private consultant foresters to complete forest management plans for landowners wishing to gain entry into these programs. In FY 95, \$40,000 was dedicated to completing plans for approximately 3,700 acres of private forestland and to cost-share practices that benefit the watershed, such as tree planting and erosion control on roads. BWM’s technical assistance to

landowners to date has resulted in the addition of several hundred acres to Chapter 61, and the completion of forest management plans on 2,115 acres within the Wachusett Reservoir watershed.

While the full-time private lands forester position ended in 1998, BWM staff has continued to perform outreach and forest management plan funding through a series of contracts in the three watersheds to encourage good practices and to aid land owners in entering the Forest Stewardship and Chapter 61 programs.

Assessment

Providing technical and monetary assistance to individual landowners is an effective way to promote properly designed timber harvesting practices on private lands. Encouraging appropriate and sound forest management on private land reduces the likelihood of development and promotes a diverse forest cover.



A well-planned silvicultural site.

Control Approach

Goals

- To encourage owners of privately held forested land to practice sound forest management.

Objectives

- Continue to help landowners maintain their property in an undeveloped state.
- To support landowners to implement forestry Conservation Management Practices and maintain a healthy, species diverse, multi aged forest on their property.

Action Items

- Renew the three year contract for private lands stewardship assistance.
- Continue to review all forest cutting plans that occur on the watershed.

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